

ESTIMATION OF SHELL-STEEL INTERFACE REACTIONS IN THE CERAMIC SHELLS MADE OF FUSED SILICA, ALUMINA AND ZIRCONIA

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ABSTRACT

Ceramic shell process is now used widely for production of small and medium sizes of precision steel castings having complicated geometry for different applications. When steel is poured into preheated ceramic shells, there is the possibility of chemical reactions at the mold-metal interface.

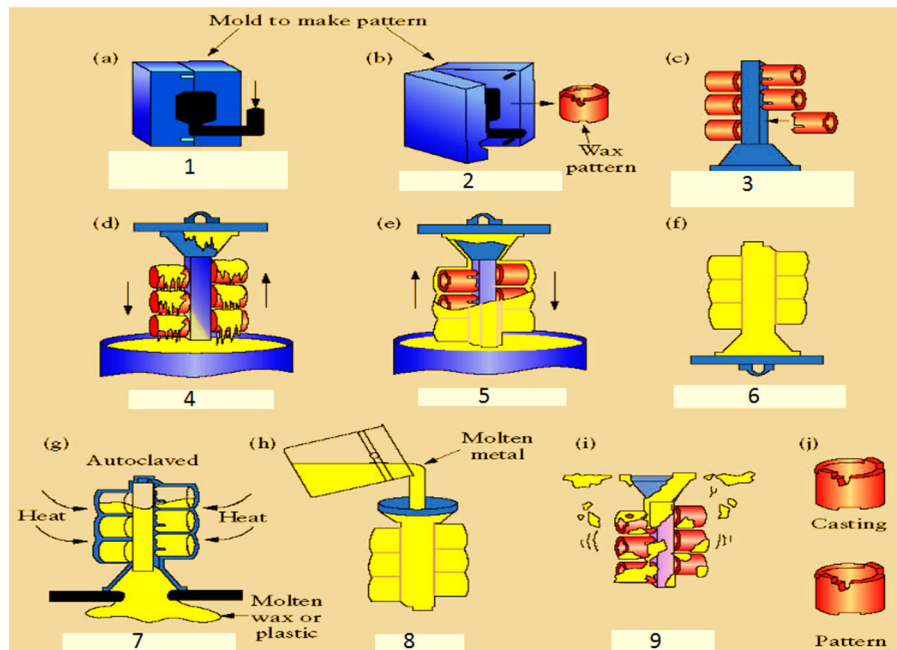


Figure 1: The ceramic shell process.

In the present work, the ceramic shells were prepared using fused silica, zirconia, and alumina as prime coats to study the shell-low carbon alloy steel interaction at the interface.

Al-Si-Mn-O phases were observed at the interface of shell-steel for the castings made from fused silica ceramic shells. The same kind of phases were also observed in the ceramic shells made of alumina. Fe-O-Zr-Si phases were observed at the interface of ceramic shells made of zirconia. The reasons could be that the fused silica, alumina and zircon can readily react with the steel slag containing Mn and Fe oxides at pouring and steel solidification temperatures with formation of liquid phase. The difference was the amount of liquid phase. The degree of superheat would also result in greater amount of liquid slag formed causing the chemical reactions at the interface of shell and steel. Ceramic shells with zirconia in the prime coat had least amount of interaction products and less depth of reaction.

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